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AGRICULTURAL EXPERIMENT STATION — EXTENSION SERVICE

Farm Electrification Committee and Agricultural Engineering
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Light for Seeing

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RESearch EXPERTS say that 87 percent of our impressions comes through sight. The other 13 percent comes through the four senses of touch, taste, sound, and smell. For this important sense of sight to operate properly, we must have plenty of good quality light. Even on cloudy and dark days, there is enough light to do most of the things that need to be done outside. But indoors and at night we need artificial light.

The most common source of artificial light today is that produced by electricity. It is efficient, safe, convenient, and easily adapted to automatic and remote control when needed. Sufficient light for various kinds of work requires adequate wiring. Operating electrical equipment with wire that is too small is like trying to operate a gas engine with the gas-line partially plugged. If you are to get the most out of electric lights, wires should be large enough to carry the load and there should be enough circuits to provide the correct amount of current.

GOOD LIGHTING IS PLANNED

Planning the lighting of a new or remodeled building is as important as the plans for the structure. Poor lighting can cause beautifully decorated rooms to look flat and uninteresting, or cast undesirable shadows where there should be light. Glare causes un-

due eye fatigue and prevents proper seeing. Too little light also causes the eyes to tire quickly, and is a danger hazard, especially on stairways, and in narrow hallways.

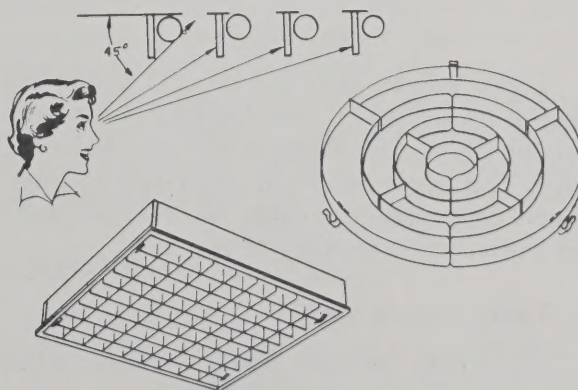
The Better Light Better Sight Bureau of the Edison Electric Institute offers these suggestions:

3 BASIC REQUIREMENTS OF LIGHTING UNITS

1. The lamp bulb should not be visible

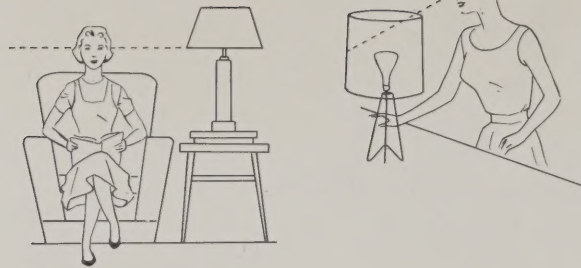
Glare is the enemy of seeing, and bare bulbs, or even a portion of a bulb is an annoying source of glare. Shielding of bare bulbs can be done by:

(a) louvers,

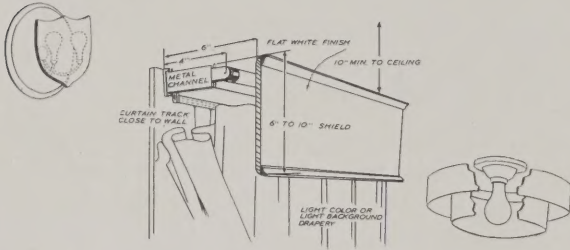


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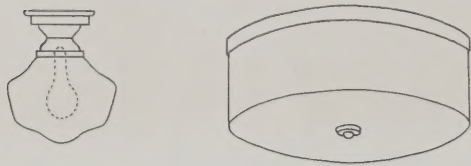
(b) shades,



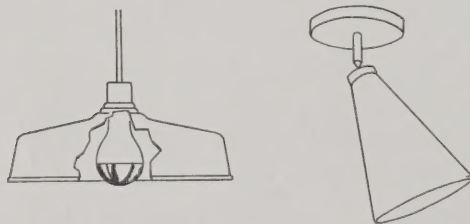
(c) shields,



(d) enclosed housings,



(e) reflectors,



Light sources that are located above the eye level should be shielded so that no bulb or tube is visible within a 45° arc above the eye. This angle has been suggested by engineers as generally outside the normal range of vision when viewing at eye level.

Lamp shades should:

(a) shield the bulb from the viewer when reading or standing nearby.

(b) be translucent or opaque and are often made of parchment, fabric, plastic, and sometimes metal. Translucent material should diffuse the light sufficiently to avoid a hot or bright spot in the shade. Colored opaque shades are used to blend in with dark walls, not only for beauty, but to reduce contrast. Use light colored shades against light walls for the same reason.

(c) spread the light over a sufficiently large area to cover the space in which the light is needed.

(d) project some light upward to provide general illumination. The R-40 indirect white bulb is designed particularly for this purpose. Sometimes a lamp viewed from above the top of the shade is a source of glare. A translucent material may be placed on the top opening of the shade to reduce this glare.

(e) have *white* linings to diffuse and reflect the light where needed.

Table 1. Dimensions of well-designed portable lamps.

| Type of lamp | Height to bottom of shade | Shade | |
|-------------------|---------------------------|--|----------|
| | | bottom dia. | top dia. |
| Table lamp | 15"—17"** | 16" min. | 9" min. |
| Junior floor lamp | 45"—47" | 16" min. | 9" min. |
| Senior floor lamp | 47"—49" | 18" min. | 10" min. |
| Bridge lamp | 46"—48" | 13" min. | 8" min. |
| Torchiere | 64" min.** | 12" min. dia. of reflector not visible in a horizontal plane at top of torchiere | |

*40-42" bottom of shade to floor

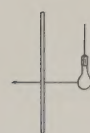
**to top of reflector

- (f) have the lower edge of the shade level with the bottom of the bulb socket.
- (g) follow the recommendations of the Illuminating Engineering Society for overall dimensions of lamps (table 1). Note that lamp shades, sizes, and shapes are not only a matter of appearance but their design must conform to the good lighting requirements of shielding, diffusing, and spreading of the light. Bulbs shielded by valences and under cabinets must be placed far enough above the bottom of the valence or cabinet rail to remove them from direct view from normal position in the room.

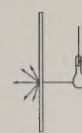
2. Scatter the light

- (a) Use translucent plastic or frosted glass to diffuse the light. The use of glass diffusing bowls, white or near-white shade linings, and the R-40 white indirect bulb help spread the light from lamps.

| height | Bulb recommended types | Fitting or Reflector |
|------------|--|--|
| 9" min. | R-40, 150W 50-100-150W 100-200-300W general service 100W 150W or 3-light | 8"-10" harp (R-40) 8" bowl 8"-10" bowl |
| 9" min. | general service 150W R-40 three light 50-100-150W | 8"-10" bowl 9"-11" R-40 harp |
| 10" min. | three light 100-200-300 | 10" diffusing bowl |
| 9" min. | general service 150W three light R40, 150W or 3-light 50-100-150W | 8" bowl diffuser 8" bowl diffuser R-40 wide harp |
| bulb plane | three light 100-200-300W | torchieri reflector |



TRANSPARENT



TRANSLUCENT MATERIAL
COATED OR FROSTED

- (b) Paint opaque reflecting surfaces a flat white.
- (c) Two or more small bulbs spread the light better than one large bulb for some installations.
- (d) Frosted bulbs, inside coated bulbs, and fluorescent lamps help diffuse the light from the source and give better results than clear bulbs.
(NOTE: Colored bulbs greatly reduce the amount of light.)

3. Provide enough illumination

- (a) Select a bulb size or combination of bulbs to provide the recommended level of illumination required for the task (see table 2).
- (b) Select a bulb type best suited to your lighting requirements, then design your lighting unit around the bulb selected.
- (c) Reflectors can often be used to direct the light and concentrate it on the seeing task. They increase illumination without resorting to higher wattage light sources.

After the proper type of lighting has been selected, the next important thing is to locate it properly. A good light can be rendered ineffective if improperly placed. The important thing to remember is to *light the thing you want to see* and not your eyes. Any light shining directly into the eye can cause uncomfortable glare.

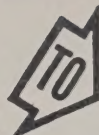
SOURCES OF GLARE

Most of the sources of glare found around the home and the farm buildings can be eliminated. Here are some of the common causes.



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1. Any unshielded light source.
2. Reflection from polished or slick surfaces, such as glass, enamel cabinets, highly polished table tops and furniture, mirrors, or high-gloss paper and paint.
3. Direct rays of sunlight. Sun shining through a window into a dark room is an unshielded light, a source of glare. For this reason, it is not advisable to put work areas such as cabinets, sinks, and work benches or desks under windows, especially if the rest of the room will be quite dark or if they face the sun, unless curtains or blinds are used as shields.

Everything possible should be done to get rid of glare when there is prolonged and concentrated use of the eyes. Painted surfaces should be painted with flat, light colored paints. Glossy tables and desks that are used for study should be covered with a cloth. Windows should be curtained to screen out some of the light, particularly direct sun rays. Portable lamps should be moved so that they do not reflect off mirrors or television screens. If it is a permanent light that is reflected, move the reflecting surface.

GOOD LIGHTING TECHNIQUES

Every room in the home or workshop or barn should have some source of general lighting, a source that will give soft light

Table 2. Foot-candle requirements

| Area or activity to be lighted | Foot-candles |
|---|--------------|
| Barnyard and yard, animal buildings..... | 1 |
| Laying house, recreational area, halls and stairways | 5 |
| General lighting, kitchen, milk house, granary | 10 |
| Periodic reading or writing, milk house washing area, shop working areas, power machinery | 20 |
| Shop workbench, working with wood and metal | 30 |
| Reading, desk, and study table, work areas in kitchen | 40 |
| Fine machine work, wood finishing, sewing | 50-70 |
| Sewing on dark material, fine inspection..... | 70-100 |

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throughout the area and that is bright enough for comfort while doing routine chores, visiting, watching television, or limited reading.

Activities such as prolonged reading, study, sewing, working on fine machine parts, and washing milking utensils, require additional light. This is best supplied by local light sources such as reading lamps, table lamps, good desk lamps, and lights hung over work areas. These lights should be properly placed so that the light falls on the work and shielded so that the bulb is not visible to the eye.

SUMMARY

- Plan your lighting with care
- A good lighting unit should:
 - hide the lamp
 - scatter the light
 - provide enough light
- Avoid glare by:
 - shielding the light source
 - eliminating reflections
 - shading windows with awnings or curtains
- Provide each living or working area with some general light
- Provide localized light for localized tasks.